ANTARCTIC RESEARCH

Program Announcement and Proposal Guide

to be used with: GRANT PROPOSAL GUIDE (NSF 95-27)

AERONOMY/ASTROPHYSICS
BIOLOGY/ECOLOGY
CLIMATE SYSTEMS/METEOROLOGY
ENVIRONMENTAL RESEARCH
GEOLOGY/GEOPHYSICS
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NSF 95-64 (Replaces NSF 94-4)

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- NSF publication number;
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ANTARCTIC RESEARCH OPPORTUNITIES

The National Science Foundation invites scientists at U.S. institutions to submit proposals—

—to perform research in Antarctica

—to perform related research and data analysis in the United States

Successful candidates will be provided funds and operational support needed to perform the research.

Candidates, particularly those who have not participated in the U.S. Antarctic Program, are encouraged to contact science program managers or operations specialists at the Foundation's Office of Polar Programs (see roster in this book) to assure an effective proposal that is supportable operationally. To the extent possible, science requirements determine the makeup of the program's operational support. Office of Polar Programs staff want to hear from scientists planning research so that support can be developed and put into place and so that safety, environmental, and health requirements can be satisfied.

This brochure summarizes antarctic research opportunities, describes support available in Antarctica, explains how to prepare a proposal for research project support, provides worksheets to be used in preparing the proposal, and suggests sources of further information.

Deadline for proposals

Antarctic proposals may be submitted each year during the 1-month window between 1 May and 1 June. Proposals received before May normally will be returned to you. Proposals postmarked after 1 June may be returned.

Other publications you may need

If you plan to write a proposal, please get the following books (they are free).

NSF 95-27, ***Grant Proposal Guide***. Proposals to NSF must be prepared in accordance with this 61-page book, which also contains worksheets to make things easier for you, NSF, and reviewers.

NSF 95-154, ***Antarctic Conservation Act of 1978 (Public Law 95-541), with Regulations, Descriptions and Maps of Special Areas, Permit Application Form, Agreed Measures for the Conservation of Antarctic Fauna and Flora, and Protocol on Environmental Protection***. The Antarctic Treaty includes international agreements to protect Antarctica from environmental degradation. The Antarctic Conservation Act is the U.S. law that enacts the treaty's environmental-protection provisions. For most research proposals, the book now in your hands provides enough information about the Act to enable you to decide if your proposed activities would be legal and if a permit would be needed. However, U.S. investigators in Antarctica must be familiar with all aspects of the Act. They must ensure that their teams will perform research in accordance with restrictions described in the publication.

To order paper copies of publications, or to read or download them electronically, see the instructions on the inside front cover of this book.

U.S. ANTARCTIC PROGRAM

Scientific research, and operational support of that research, are the principal activities supported by the United States Government in Antarctica. The goals are to expand fundamental knowledge of the region, to foster research on global and regional problems of current scientific importance, and to utilize the region as a platform or base from which to support research. The U.S. Antarctic Program supports only that research that can be done exclusively in Antarctica or that can be done best from Antarctica.

In the U.S. Antarctic Program, three year-round research stations, additional research facilities and camps, airplanes, helicopters, various types of surface vehicles, and ships support approximately 130 research projects each year at numerous locations throughout the continent and its surrounding oceans. The research is performed by investigators from universities and, to a lesser extent, from federal agencies and other organizations.

The program has been in continuous operation since the 1957-1958 International Geophysical Year. U.S. activities in Antarctica support the Nation's adherence to the Antarctic Treaty, which reserves the region for peaceful purposes and encourages international cooperation in scientific research. At present, 43 nations adhere to the treaty, and about 27 of them participate in antarctic field activities.

The National Science Foundation funds and manages the U.S. Antarctic Program. NSF antarctic funding in fiscal 1995 was as follows:

Awards to institutions for research	$ 29,060,000
Direct support of research projects	42,070,000
Operational support	124,700,000
Total, U.S. Antarctic Program	$195,830,000

The Foundation supports antarctic research in these areas:

Aeronomy and astrophysics

The polar regions have been called Earth's window to outer space. This term originally applied to study of aurora and other

phenomena related to interaction of solar plasmas and fields. In this context the polar upper atmosphere is a screen on which the results of such interactions can be viewed and through which other evidence of space physics processes can pass. Today, this concept of Earth's polar atmosphere as a window includes research in other fields as well. With discovery of polar stratospheric ozone depletions, a window previously thought "closed" (the ultraviolet window) is now known to "open" in certain seasons. In astronomy and astrophysics, favorable atmospheric conditions and the unique location of the South Pole enable scientists to use this window to probe the structure of the Sun and the universe with unprecedented precision.

The aeronomy and astrophysics program supports studies of three regions:

- the stratosphere and the mesosphere. Current research focuses on stratospheric chemistry and aerosols, particularly in the context of the ozone hole. The polar stratosphere is expected to be a field of continued interest and growth.
- the thermosphere, the ionosphere, and the magnetosphere. These regions derive many of their characteristics from the interplay of ionized plasmas and energetic charged particles with geomagnetic and geoelectric fields. The upper atmosphere, particularly the ionospheric portion of it, is the ultimate sink of solar wind energy that is transported into the magnetosphere. Energy dissipates in the ionosphere because of particle precipitation, which is the result in part of resonant wave-particle interactions, and because of the Joule heating that is a result of currents driven by electric fields.
- astronomy and astrophysical studies of the regions of the universe outside the magnetosphere, including solar astronomy and cosmic ray physics. Astrophysical studies are primarily conducted at the South Pole station or on long-duration balloon flights launched from McMurdo.

Major goals are to sponsor research that requires or would benefit from the unique conditions of the Antarctic, to contribute to understanding of the role of the Antarctic in global environmental change, to participate in interdisciplinary studies of geosphere-biosphere interactions in the middle and upper atmosphere, and to improve understanding of the coupling of the Earth's polar atmosphere with the magnetosphere and of the ways in which both are affected by solar activity.

Biology and medical research

The goal of antarctic biology and medical research is to improve understanding of life phenomena and processes. The program supports projects directed at all levels of organization from molecular, cellular, and organismal to communities, ecosystems, and global processes. Investigators should apply recent theory and technology to understanding how organisms, including humans, adapt and live in high latitude environments and how ecosystems may respond to global change. Support is focused on these areas:

- Marine ecosystem dynamics. Understanding the natural variability of marine ecosystems is the goal. An important direction is toward correlating the structure and function of the marginal ice-zone ecosystem with oceanic and atmospheric processes. Of particular interest is the influence of nutrient limitations on primary production and the role of marine phytoplankton in carbon dioxide cycling. Proposals to develop data collection technologies such as satellite remote sensing are encouraged.
- Terrestrial and limnetic ecosystems. Organisms in ice-free areas and in perennially ice-covered lakes show remarkable adaptations. The presence of relatively few species eases study of ecosystem dynamics and interpretation of experiments. Research is needed on adaptive mechanisms and evolutionary processes. Studies that include molecular biological approaches are encouraged. The McMurdo Dry Valleys of southern Victoria Land are of particular interest.
- Population biology and physiological ecology. Research is supported in population dynamics, especially metabolic, physiological, and behavioral adaptations of krill and other zooplankton and fish species. Marine mammals and birds have been the object of much research and merit further attention in some areas. Mechanisms necessary for maintenance of cell function in fishes and their feeding behavior are important topics. Long-term observations are needed to improve understanding of manmade or natural changes.
- Adaptation. The extremes of light, temperature, and moisture have resulted in unusual adaptations. Research topics include low temperature photosynthesis and respiration, enzymatic adaptations, adaptive strategies such as development of antifreeze compounds and modifications to circulation systems, and the response of organisms to increased UV-B from the ozone hole. Biotechnology offers unique approaches to addressing questions involving adaptation, and such applications are of special interest.
- Human behavior and medical research. Antarctica's extreme climate can induce social, psychological, and physiological stresses, particularly during the winter isolation, which can exceed 8 months. Research has applications to human health and performance both in the Antarctic and in other isolated environments such as spacecraft. Studies can focus on topics such as epidemiology, thermal regulation, immune system function, individual behavior, and group dynamics.

Geology and geophysics

Antarctica represents about 9 percent of Earth's continental crust and has been in a near-polar position for more than 100 million years. It is covered by a continental ice sheet with an average thickness of 3 km. There is unequivocal evidence that

for a long period after the continent arrived at its high-latitude position, extensive continental ice sheets did not exist there. The ice sheets, through their interaction with and effect on oceanic and atmospheric circulation, play a key role in modulating global climate.

Some important program goals include:

- determining the tectonic evolution of Antarctica and its relationship to the evolution of the continents from Precambrian time to the present
- determining Antarctica's crustal structure
- determining the effect of the dispersal of antarctic continental fragments on the paleocirculation of the world oceans, on the evolution of life, and on global paleoclimates and present climate
- reconstructing a more detailed history of the ice sheets, identifying geological controls to ice sheet behavior, and defining geological responses to the ice sheets on regional and global scales
- determining the evolution of sedimentary basins within the continent and along continental margins

All of these problems involve the need for an improved understanding of where, when, and how Antarctica and its surrounding ocean basins were accommodated in the interplate movements inferred from studies of global plate kinematics. In short, the program encourages investigation of the relationships between the geological evolution of the antarctic plate and paleocirculation, paleoclimate, and the evolution of high-latitude biota.

In geophysics, the continent and its environs have a central role in the geodynamic processes that have shaped the present global environment. The tectonic role of the antarctic continent in the breakup of Gondwanaland, the close interaction of the antarctic crust and ice sheet with their attendant effects on the planet's fluid systems, and Antarctica's present-day seismically quiescent role defines the important thrusts of geophysical research in the high southern latitudes. Modern geophysical and logistical technology might focus on three broad "transect zones," across the Weddell and Ross embayments and in the area of the Amery Ice Shelf, where prospects for broad-scale understanding of the region are highest.

Ocean and climate systems

Antarctic oceanic and tropospheric studies focus on the structure and processes of the ocean-atmosphere environment and their relationships with the global ocean, the atmosphere, and the marine biosphere. As part of the global heat engine, the Antarctic has a major role in the world's transfer of energy. Its ocean/atmosphere system is known to be both an indicator and a component of climate change.

Research sponsored by the ocean and climate systems program is intended to improve understanding of the oceanic environment at high latitudes, including global exchange of heat, salt, water, and trace elements, sea-ice dynamics, and tropospheric chemistry and dynamics. Major program elements include—

- Physical oceanography, concerned with understanding the dynamics and kinematics of the polar oceans, the effects of interface driving forces such as wind, solar radiation, and heat exchange, water mass production and modification processes, ocean dynamics at the pack ice edge, and the effect of polynyas on ventilation.
- Chemical oceanography, concerned with chemical composition of sea water and its global speciation, reactions among chemical elements and compounds in the ocean, fluxes of material within ocean basins and at their boundaries, and the use of chemical tracers to study time and space scales of oceanic processes.
- Sea ice dynamics, including study of the material characteristics of sea ice down to the individual crystal level and the large-scale patterns of freezing, deformation, and melting. These processes have implications for both atmospheric and oceanic "climates." Advances in instrumentation, including remote sensing or telemetering of ice type, thickness, motion, and growth, should enable large scale dynamics of sea ice to be monitored over long periods.
- Meteorology, concerned with atmospheric circulation systems and dynamics. Research areas include the energy budget; atmospheric chemistry; transport of atmospheric contaminants to the Antarctic; and the role of large and mesoscale systems in global exchange of heat, momentum, and trace constituents.

Glaciology

Snow and ice are pervasive elements of high latitude environmental systems and have an active role in the global environment. The glaciology program is concerned with the study of the history and dynamics of all naturally occurring forms of snow and ice, including floating ice, seasonal snow, glaciers, and continental and marine ice sheets. Program emphases include paleoenvironments from ice cores, ice dynamics, numerical modeling, glacial geology, and remote sensing of ice sheets. Some specific objectives are:

- Correlation of climatic fluctuations evident in antarctic ice cores with data from arctic and lower-latitude ice cores, and integration of the ice record with the terrestrial and marine record.
- Documentation of the geographic extent of climatic events noted in paleoclimatic records; and the extension of the ice core time series to provide information on astronomical forcing of climate.
- Establishment of more precise dating methodologies for deep ice cores.

- Determination of the Cenozoic history of antarctic ice sheets and their interaction with global climate and uplift of the Transantarctic Mountains; response of the antarctic ice sheets to the Pliocene warming.
- Investigation of the physics of fast glacier flow with emphasis on processes at glacier beds.
- Investigation of ice-shelf stability.
- Identification and quantification of the feedback between ice dynamics and climate change.

The Polar Ice Coring Office (PICO) is supported by the Office of Polar Programs to service the technological requirements of glaciologists. PICO focuses on ice drill development for NSF-supported remote field projects. Investigators who plan to request technical support from PICO should include with their proposal a cost estimate (budget and justification) for the equipment or drilling support that might be provided by PICO if the project is funded. This information is in addition to the regular budgets included with the proposal. Investigators should contact PICO if they have questions or need further information for a correct cost estimate. The Glaciology Program Manager (see roster) should be notified when an investigator is requesting PICO support.

Environmental research

This program supports scientific research that can help reduce the environmental impact of NSF's activities in Antarctica. Areas of inquiry might include policy research, effects of past practices, materials and waste management, current impacts, resilience of ecosystems, and promising technologies.

Proposals will be considered from basic and applied research disciplines in any field of science, mathematics, or engineering normally supported by NSF at academic institutions, Federal agencies, and the private sector.

A program announcement is available from the Antarctic Science Section (see roster).

Instrumentation

Supporting complex, state-of-the-art, multidisciplinary research in the Earth's most remote and hostile region is a challenge met increasingly by instrumentation. Off-the-shelf instruments, highly capable computers, and support for the development of new instruments are requested frequently in research proposals.

Some existing instruments are well-suited for polar regions; they can gather data year-round at low operational cost. Use of these instruments can reduce the number of people required to make measurements and even increase the reliability of the collected data. Unattended instruments for collection and analysis of data are essential in Antarctica, where the extreme environment, great distances, and logistics constraints limit the spatial and temporal extent of coverage.

Instrumentation development and support will be considered for funding in such areas as these:

1. Acquiring new research equipment or modernizing existing equipment.
2. Developing instruments or techniques that extend research capabilities—from making full-scale tests of new instruments or technologies to modifying existing systems. These are typically multiyear projects in which observational parameters, data types, and feasibility of implementing a technology have been demonstrated.
3. Supporting research technicians.
4. Doing demonstration or feasibility projects to test an idea for enhancing existing instrumentation; the projects should have achievable goals within a finite time.
5. Developing new or enhanced remote sensing techniques. Partnerships with engineering faculty in collaborative projects are strongly encouraged.

Integration of technique development with scientific applications should be described carefully; examples include sensor technology, e/m wave propagation and scattering, modeling, data handling, and advanced computational strategies and algorithm development.

Submit instrumentation proposals to the disciplinary program area in which the instrumentation will be used.

FACILITIES, LOGISTICS, AND SUPPORT

Facilities for research in Antarctica include research stations with scientific equipment and laboratories, helicopters, ski-equipped LC-130 airplanes, Twin Otter airplanes, surface vehicles, a wide array of equipment for use in establishing temporary camps, an ice-strengthened research ship, a research icebreaker, and a logistics icebreaker. These facilities are operated under the guidance of NSF's Polar Research Support Section (703-306-1032) by a contractor (Antarctic Support Associates, 303-790-8606) and its subcontractors, by military units of the Department of Defense, and by the U.S. Coast Guard. The following facilities are expected to be available in the Antarctic.

McMurdo Station (77°53'S 166°40'E)

McMurdo, on Ross Island, is the largest station in Antarctica, accommodating up to 1,200 people in summer and 250 in winter. It occupies the globe's farthest south land accessible by ship; adjacent ice supports runways and skiways for large airplanes.

The Albert P. Crary Science and Engineering Center at McMurdo, opened in 1991, is a state-of-the-art facility that enables sophisticated laboratory procedures in the range of antarctic disciplines. It has lab space, aquarium space, staging areas, analytical instrumentation, personal computers and work stations, a local area network, and full access to Internet.

The Crary Lab also supports environmental and ecological investigations, bioassays, industrial hygiene surveys, chemical analyses, and snow and ice mechanics and engineering. A meteorology center has AVHRR, HRPT, DMSP, and other data archives and an interactive data access system.

The Crary Lab has five pods in three phases, or wings, totaling 4,320 square meters of working area. Phase I has a two-story core pod (for telecommunications and information) and a biology pod. Phase II has earth science and atmospheric science pods. Phase III has an aquarium and a wet lab.

The Crary Lab replaces outdated science buildings that were built as early as 1959. Additional McMurdo facilities support research involving diving, balloon launches, field party training and outfitting, upper atmosphere investigations, etc.

In summer, portable shelters and equipment aid research on and under the sea ice of adjacent McMurdo Sound; helicopters support projects and camps within 150 kilometers of the station; and surface vehicles provide local transportation and support for traverses.

McMurdo is the hub of the program; in summer it has a seaport and two airfields. The program's helicopters, LC-130 transport airplanes, and, in some years, leased Twin Otters are based at McMurdo. Persons en route to South Pole and to most remote field camps pass through McMurdo.

Air transportation is provided between New Zealand and McMurdo several times per week from the first of October to late February. Flights are made to and from the station over several days in mid-August. At other times the station historically has been isolated. A runway on glacier ice ("Pegasus") became operational in February 1992; wheeled airplanes can use it most of the year. The U.S. Antarctic Program will be receptive to proposals for research any time of year at McMurdo including winter.

Communications between McMurdo and the rest of the world are available year-round, 24 hours a day, and include telephone, electronic mail, Internet including the World Wide Web, and amateur voice radio. Regular U.S. mail service is available in summer.

The McMurdo region has been the object of vigorous scientific attention. An abundant literature presents questions for further study in marine biology, earth sciences, and other areas.

Amundsen-Scott South Pole Station (90°S)

Opened in 1957, Amundsen-Scott South Pole Station was rebuilt in 1975 as a research facility under a geodesic dome and steel arches. In recent years it has undergone substantial renovation and improvement to handle increased research needs. The station is at an elevation of 2,835 meters on the continental ice sheet and has a mean temperature of minus 49.3°C.

Flights between McMurdo and South Pole are frequent from late October to mid-February; the station is isolated at other times. February-to-October (austral winter) population is about 28. About 150 can be accommodated in the summer.

The station has a clean-air research facility and computer systems for research and communication. It is an important monitoring station for atmospheric constituents and meteorological data and is ideally located for studies of the cusp region of the magnetosphere. Astrophysics has flourished at the station in recent years, taking advantage of excellent optical properties of the atmosphere above the station resulting from its high elevation and the extremely low temperature and humidity. A biomedical research facility is available. Other active areas of current interest include geophysics, upper atmosphere sciences, and glaciology.

Palmer Station (64°46'S 64°03'W)

Palmer, on Anvers Island near the Antarctic Peninsula, has been in operation since 1965. It is operated in conjunction with an ice-strengthened research ship (*Polar Duke* until 1997, then *Laurence M. Gould*). Small boats are available for sampling in the sea and at nearby islands. Access to Palmer, which is year-round, generally is by ship from the southern tip of South America.

The climate at Palmer is less severe than that at the other U.S. stations, and the fauna and flora are diverse. There are many opportunities for biology at or near the station; other disciplines (e.g., meteorology, upper atmosphere physics) also are represented. Palmer has extensive biology laboratories, including wet lab areas and sea water aquaria. See worksheets below for specifications. Palmer's population has ranged from 8 to 12 in winter to above 40 in summer.

The Palmer Station area in 1990 was designated by the National Science Foundation as a Long Term Ecological Research (LTER) site. For information contact the biology program manager at OPP.

Temporary camps

In the austral summer, aircraft from McMurdo can place scientific parties almost anywhere on the continent. Tents or heated shelters and snowmobiles can be provided. Helicopters sometimes are deployed to remote locations for close support of research parties. Substantial camps remote from McMurdo Station can be established for large research groups.

Automated data gatherers (AGO and AWS)

The program supports automated geophysical observatories (AGOs) for unmanned collection of data at remote locations. Investigators wishing to use these facilities or the resulting data should contact a science program manager (see Office of Polar Programs roster).

Automatic weather stations (AWSs) have been placed at various locations in Antarctica. For information and data, contact Dr. Charles Stearns, Department of Meteorology, Univer-

sity of Wisconsin, 1225 W. Dayton Street, Madison, Wisconsin 53706 (chucks@ssec.wisc.edu, or see the home page http://www.ssec.wisc.edu/~rbrbrn/awsproj.htm).

UV radiation monitoring network

The program operates precision spectroradiometers optimized for measuring solar ultraviolet radiation at South Pole, Palmer, and McMurdo in Antarctica and at Ushuaia, Argentina, Point Barrow, Alaska, and San Diego. Data are distributed regularly in support of seasonal research and are available annually on CD-ROM. The data include irradiance scans and databases of integrated UV exposure and a variety of dosages. Contact Biospherical Instruments, 5340 Riley Street, San Diego, California 92110-2521 (support@biospherical.com or http://www.biospherical.com/).

Research ships

Polar Duke. The Antarctic Program's chartered 67-meter-long ice-strengthened *Polar Duke* can accommodate 22 researchers. The ship is equipped for marine biology, physical and chemical oceanography, and marine geophysics. It operates frequently along the Antarctic Peninsula and in the South Shetland Islands; research cruises are made elsewhere as required. Several trips are made between South American ports and Antarctica each austral summer.

Polar Duke was built in 1983 for science and transport of polar expeditions. The hull has an ice classification rated for light icebreaking. The ship is thus permitted to perform missions in moderate pack ice, but must stay clear of heavy ice and thick pack to avoid besetment.

The ship has five laboratories totaling about 150 square meters. Research equipment includes a seismic system, a portable isotope laboratory, and dedicated oceanographic instrumentation (e.g., CTD). The ship has a deep sea trawl winch and hydrographic winches, cranes, and A-frames. It has satellite navigation, radar, doppler, and precision depth recorders.

Polar Duke is chartered to the U.S. Antarctic Program until 1997, when *Laurence M. Gould* will replace it.

Specifications, *Polar Duke*:

Built:	1983
Length:	219 feet
Beam:	43 feet
Draft:	19 feet
Endurance:	90 days
Gross Tons:	1,594
Crew:	14
Ice Class:	1AA
Engines:	Twin diesel 2250 bhp each, bow and stern thrusters, controllable pitch 240 rpm propeller, Kort nozzle

Laurence M. Gould. Edison Chouest Offshore, which built and operates *Nathaniel B. Palmer* (see below), is building and will operate this ship for the U.S. Antarctic Program beginning in 1997 to replace *Polar Duke*. The new ship, 70.1 meters in length (preliminary specification), will have science functions comparable to *Polar Duke*, including A-frames, winches, towing gear, a wet lab, a hydro lab, a dry lab, an electronics lab, and an aquarium room. It will accommodate 26 researchers and support technicians, most in double rooms each with heads.

Nathaniel B. Palmer. A research vessel with icebreaking capability, *Nathaniel B. Palmer*, 94 meters in length, began antarctic operations in 1992 under a 10-year lease. The ship is a first-rate platform for global change studies, including biological, oceanographic, geological, and geophysical components. It can operate safely year-round in antarctic waters that often are stormy or covered with sea ice. It accommodates 37 scientists and support technicians, has a crew of 22, and is capable of up to 75-day missions. It has about 280 square meters of working deck area, 370 square meters of laboratory space, and modern oceanographic equipment. The ship is named *Nathaniel B. Palmer* to commemorate the American credited with first seeing Antarctica.

Instruments on *Nathaniel B. Palmer* are available for not-to-interfere underway measurements on behalf of investigators who do not join a cruise. Instruments include Seacat 21 thermosalinograph, Turner model 10 fluorometer, Simrad EK500 scientific echo sounder and other acoustic and bathymetric systems, LaCoste-Romberg gravity meter, XBTs, and meteorological sensors. A wide-swath bottom mapping system is installed. A more complete list is in a checklist worksheet in this book. Proposals for management of long-term measurements and data archiving will be considered. Identify technician staffing and other shipboard support both in the proposal and on *Nathaniel B. Palmer* worksheet in this book.

Specifications, *Nathaniel B. Palmer*:

Length overall	308.50 ft.	94.0 meters
Length on waterline	279.75 ft.	85.3 meters
Breadth, moulded	60.00 ft.	18.3 meters
Breadth, maximum	60.00 ft.	18.3 meters
Draft, design	22.5 ft.	6.6 meters
Depth	30.00 ft.	9.1 meters
Displacement	6800 LT	6620 tonnes
Light ship weight	4800 LT	5040 tonnes
Propulsion	4 main engines, total 13,000 hp, 2 shafts, variable pitch Kort nozzle propellers	

Other ships. In some years, research also may be pursued aboard University-National Oceanographic Laboratory Systems (UNOLS) ships or other ships, including those of other Antarctic Treaty nations.

Research ship EEZ clearances

Any research that is north of 60°S and involves work in the Exclusive Economic Zone (EEZ) of another nation (typically within 200 nautical miles of the coast of that nation), including

underway measurements such as collecting multibeam data, gravity data, or surface water samples, requires an appropriate research clearance from the nation involved.

Justify any EEZ work in the proposal, and provide information needed for a permit application. NSF's contractor ASA submits the application to the Department of State, which must receive it no later than 6 months before the cruise.

Airborne sensing

The Support Office for Aerogeophysical Research (SOAR) is a research facility that supports OPP-sponsored aerogeophysical work in Antarctica. The facility operates a suite of geophysical systems (gravimeter, magnetometer, laser altimeter, and ice- penetrating radar) aboard a Twin Otter aircraft. Positional information is provided by differential GPS (both pseudo-range and carrier-phase), supplemented by inertial navigation and precision pressure altimetery data.

Investigators wishing to use the SOAR facility should contact the science coordinator at SOAR no later than 60 days prior to proposal submission to ensure that the specific goals can be met, that the proposed project is technically feasible, and that the project can be accomodated with uncommitted facility time. SOAR will provide a feasibility statement to be included as an appendix for all proposals to use the faciity. Scheduling of the facility will be the responsibility of the facility management team, with direction from NSF.

SOAR is supported through a cooperative agreement between NSF and the University of Texas at Austin. Parties needing further information or wishing to add themselves to the SOAR mailing list should contact the facility's Science Coordinator, Jeff Williams, at 512-471-0491 or jeff@utig.ig.utexas.edu. The mailing address is 8701 N. Mopac Blvd., Austin, Texas, 78759-8391.

Investigators developing programs utilizing airborne remote sensing techniques which are beyond the current capabilities of the SOAR facility should contact a science program manager.

High precision GPS

The Global Positioning System (GPS) is a worldwide, all-weather navigation and positioning system operated by the Department of Defense. GPS has been used in Antarctica for several years. The use of GPS for high precision antarctic surveying (1mm - 10 m) is increasing, with applications including geodetic surveying, glacial flow measurement, aircraft position, velocity and acceleration determination, mapping, seismic instrument positioning on moving ice sheets, glacial geology, isostasy, and sample positioning.

The U.S. Antarctic Program has an agreement with University Navstar Consortium (UNAVCO) for GPS support. UNAVCO was established in 1984 as a facility by the NSF Division of Earth Sciences to provide equipment, technical, and other support to university investigators applying GPS technology to geosciences. UNAVCO has supported investigators in more than 100 regional GPS geodesy projects worldwide and supports several U.S. and international continuously operating GPS stations.

UNAVCO has been providing equipment and predeployment support to antarctic investigators since 1986. Support currently includes (1) a pool of geodetic quality receivers for the field season, (2) in-field equipment repair, (3) in-field engineering support, (4) in-field and predeployment training in the use of GPS receivers, (5) training in GPS data processing, (6) archiving of GPS data, and (7) assistance in project planning and experiment design.

UNAVCO's assistance in the design of projects includes advice about both field support and data processing. Resources are limited, and investigators who have their own receivers and field staff are encouraged to use them. Investigators who do not have access to geodetic-quality GPS receivers and are contemplating their use for high-precision surveying as part of their proposed work should contact UNAVCO (see below) to discuss the requirements. In general, proposals should build GPS expertise into the science project plan and the budget.

On the Operational Requirements worksheets, specify the number of receivers required and the time needed to complete the GPS field work. Describe how the work will be done, including any need for permanent markers. Contact UNAVCO if you need help developing this information.

UNAVCO
P.O. Box 3000
Boulder, Colorado 80307
303-497-8034 (Bjorn Johns), 303-497-8007 (Barb Perin)
303-497-8028 (fax)
http://www.unavco.ucar.edu,
select "Contact Us" polar@unavco.ucar.edu

Synthetic aperture radar

NSF encourages proposals to use antarctic synthetic aperture radar (SAR) data in oceanography, sea-ice research, glaciology, and geology. Under an agreement between NASA and NSF, an earth station has been put into operation at McMurdo. Similar earth stations have been established at the Japanese antarctic station Syowa and the Chilean antarctic station O'Higgins, enabling SAR data to be acquired from a large part of Antarctica. Data are available for areas north of 79°S from the European Remote Sensing Satellites ERS-1 and ERS-2 and the Canadian satellite RADARSAT. Opportunities exist for interferometric studies utilizing ERS-1 and -2 data collected with a 1-day separation between images. RADARSAT will be maneuvered to an "antarctic mode" to map all of Antarctica twice during the 5-year anticipated life of the satellite. Each antarctic mode event will be for a limited time: the first is planned for October 1996. Resolution varies from about 10 meters for highest resolution imagery to about 240 meters for low-resolution imagery.

Access to data is regulated according to international agreements between NASA and the foreign flight agency responsible

for the satellite. For ERS-1 and -2, data received through McMurdo are available through the Alaska SAR Facility (ASF) at the University of Alaska, Fairbanks, which is sponsored by NASA (see below). All other antarctic SAR data from ERS-1 and -2 must be requested through the European Space Agency. Antarctic RADARSAT data are available through the ASF.

Investigators submitting proposals to the U.S. Antarctic Research Program for analysis of SAR data must also submit a proposal to NASA to receive data credits.

For additional information about SAR data, contact Lyn McNutt at ASF or the ASF Distributed Active Archive Center (DAAC) User Services Office (see below). For related opportunities in NASA's Mission to Planet Earth, contact Dr. Robert Thomas at NASA headquarters (see below). For further information specific to the U.S. Antarctic Program, contact the OPP program officer for your area of research.

ASF:
Lyn McNutt
Alaska SAR Facility
Geophysical Institute
PO Box 7320
University of Alaska Fairbanks
Fairbanks, Alaska 99775-0732
Tel: (907) 474-6390
FAX: (907) 474-7290
E-mail: lyn@dino.gi.alaska.edu

ASF DAAC User Services Office
Alaska SAR Facility
PO Box 757320
Geophysical Institute
University of Alaska Fairbanks
Fairbanks, Alaska 99775-0732
Tel: (907) 474-5195
FAX: (907) 474-6166
E-mail: uso@eosims.asf.alaska.edu

NASA Mission to Planet Earth:
Dr. Robert Thomas
CODE YSG
NASA Headquarters
Washington, D.C.
Tel: (202) 358-1154
FAX: (202) 358-2771
E-mail: bthomas@mtpe.hq.nasa.gov

Specimens for research

Specimens collected in the Antarctic are available to qualified investigators for study if approved by the Foundation. For information, including the procedure for obtaining samples, contact the facilities listed below.

Ice cores. National Ice Core Laboratory, Mail Stop 939, Box 25046 DFC, U.S. Geological Survey, Denver, Colorado 80225 (303-236-5562, fax 303-236-5448), E-mail: jfitz@bspsvr.cr.usgs.gov. World Wide Web home page: http://instaar.colorado.edu/nicl/welcome.html.

Ocean-bottom sedimentary cores and grab samples; continental cores. Antarctic Marine Geology Core Library, Department of Geology, Florida State University, Tallahassee, Florida 32306 (904-644-2407) (http://geomag.gly.fsu.edu/~curator/index.html).

Meteorite samples. Secretary, Meteorite Working Group, Curator's Branch SN2, Johnson Space Center, NASA, Houston, Texas 77058 (http://exploration.jsc.nasa.gov/curator/antmet/antmet.htm).

Biological specimens. National Museum of Natural History, Department of Invertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560 (202-357-2030, mnh.fanchald @ic.si.edu).

Non-U.S. facilities; international cooperation

The United States cooperates in research with other Antarctic Treaty nations. U.S. scientists wishing to do research with other nations' programs are asked to contact an Office of Polar Programs program manager before submitting a formal proposal.

The U.S. Antarctic Program is enthusiastically open to cooperation with other Antarctic Treaty nations when mutually beneficial. These projects often occur because of initiative taken by individual scientists. In your discussions, remember that individuals cannot commit U.S. Antarctic Program resources. Your acceptance of a generous offer from another nation's antarctic program could be construed as commitment of U.S. resources for some later project.

Do not hesitate in your collaboration with overseas colleagues, but please contact an OPP program manager (703-306-1033) upon commencing discussions that could lead to U.S. Antarctic Program involvement.

ANTARCTIC CONSERVATION ACT OF 1978: ADVICE FOR PROPOSERS

Public Law 95-541, the Antarctic Conservation Act of 1978, requires your involvement from the time you write a proposal to the time you leave Antarctica.

The law protects native mammals, birds, and plants and their ecosystems. The law applies to all U.S. citizens, whether or not they go to Antarctica with the U.S. Antarctic Program. It applies to all expeditions to Antarctica that originate from the United States.

The Act makes it unlawful, unless authorized by permit—

—to take native mammals or birds

—to enter designated special areas

—to introduce species

—to introduce substances designated as pollutants

—to discharge designated pollutants

—to import certain antarctic items into the USA

The Act provides penalties of up to $10,000 and 1 year imprisonment for each violation. Other penalties could include removal from Antarctica, rescission of a grant, or sanctions by your employer.

A Protocol on Environmental Protection was signed in 1991 by representatives of the United States and 25 other Antarctic Treaty nations. The protocol strengthens antarctic environmental standards. In early 1996 it had not officially entered into force because the necessary number of nations had not ratified it. Regardless, the United States and other Antarctic Treaty parties have said they will comply with the protocol voluntarily where possible. Many requirements of the protocol have been incorporated into regulations. The United States has said it will ratify the protocol, but the Government in April 1996 had not yet issued legislation to do so.

The book *Antarctic Conservation Act of 1978 (Public Law 95-541), with Regulations, Descriptions and Maps of Special Areas, Permit Application Form, Agreed Measures for the Conservation of Antarctic Fauna and Flora, and Protocol on Environmental Protection* (NSF 95-154) is free from NSF.

The following paragraphs discuss major provisions of the Antarctic Conservation Act and refer to the Protocol on Environmental Protection as appropriate.

Taking native mammals or birds

It is unlawful, unless authorized by permit, to take antarctic native mammals or birds. To *take* means to remove, harass, molest, harm, pursue, hunt, shoot, wound, kill, trap, capture, restrain, or tag a native mammal or bird or to try to do so.

If you are on the sea ice near McMurdo and try to hustle a Weddell seal into position for a photograph, you are breaking the law. If you are an ornithologist with a grant to band giant petrels, you may not do so until you apply for and receive a permit. A grant and a permit are two different things.

Mineral samples for scientific purposes normally may be collected and removed from Antarctica without an Antarctic Conservation Act permit. However, the Act requires a permit for "any activity that results in the significant adverse modification of habitats of any species or population of native mammal, bird, plant, or invertebrate." The Antarctic Protection Act of 1990 (Public Law 101-594) states, "it is unlawful for any person to engage in, finance, or otherwise knowingly provide assistance to any antarctic mineral resource activity."

Entering designated special areas

A number of precisely defined places in Antarctica are designated under the Antarctic Treaty, and in the U.S. law, as Specially Protected Areas or Sites of Special Scientific Interest. You must have a compelling need to enter one of these areas, and you must have a permit to do so.

Some of these special areas are near stations, such as Arrival Heights next to McMurdo or Litchfield Island near Palmer. Other special areas like the Barwick Valley are in remote locations in which geologists, for example, may want to work. The areas and their *management plans*, with which you must comply if you are permitted to enter, are described in publication NSF 95-154.

Introducing species

Introducing nonindigenous species to Antarctica (*i.e.*, south of 60°S latitude) generally is prohibited. However, if your work requires it, a permit may be issued for the following species under controlled conditions:

(a) domestic animals and plants

(b) laboratory animals and plants including viruses, bacteria, yeasts, and fungi

Living nonindigenous species of birds may not be introduced into Antarctica.

If you are uncertain whether the species you need to take to Antarctica is considered an introduced species, please contact the biology program at NSF (see roster in this book).

Introducing substances designated as pollutants

The Antarctic Conservation Act regulates what types of materials can be taken to Antarctica and specifies how these materials must be used, stored, and disposed of.

Banned substances. These substances are banned from Antarctica:

(a) pesticides (except those required for science or hygiene: a permit is needed)

(b) polychlorinated biphenyls (PCBs)

(c) nonsterile soil

(d) polystyrene beads and plastic chips

Designated pollutants. This category is large and will require attention if you get a grant to work in Antarctica. Then, the Foundation's contractor Antarctic Support Associates will help you report the materials that fall in this category.

At the proposal stage, it is enough to think about how to *minimize* the types and amounts of substances you need, to *substitute* benign substances for designated pollutants wherever possible, and to *handle* the designated pollutants that you must take. In the proposal and, if you get a grant, in your later dealings with Antarctic Support Associates, err on the side of *disclosure*. In the proposal's *Operational Requirements* package, use the worksheet in this book to list major amounts of waste you expect to generate.

Designated pollutants include any substance listed by name or characteristic (flammable, corrosive, reactive, toxic) in the Clean Air Act, the Clean Water Act, the Resource Conserva-

tion and Recovery Act, and other U.S. regulations. Waste containing designated pollutants is *antarctic hazardous waste*, and it has to be used, stored, and disposed of in controlled ways.

Many research and industrial supplies — and common substances like lighter fluid and fingernail polish remover — at U.S. antarctic stations are designated pollutants. Designated pollutants must be *permitted* to enter Antarctica. NSF's contractor Antarctic Support Associates annually compiles an application for a master permit to cover common items. The task obviously requires the cooperation of grantees; this chore is part of preparing for research in Antarctica.

Discharging designated pollutants

Some categories of waste must be removed from Antarctica. The list includes radioactive materials, batteries, fuel, heavy metals, lubricants, treated timbers, plastic (except low density storage bags), solid noncombustibles, and drums that held oil or chemicals.

The U.S. Antarctic Program employs specialists to handle and remove designated pollutants in accordance with the regulations. Grantees receive assistance and instructions in the Antarctic, but are required to keep track of the designated pollutants they use, to sort and store them according to instructions provided, and to turn the waste over to U.S. Antarctic Program officials in accordance with specified procedures.

Open burning is prohibited in Antarctica. If your proposal will include the operation of a remote field camp, plan to haul all your trash back to the station or ship from which you began your sortie.

Import into and export from the USA

In the United States it is unlawful, unless authorized by regulation or permit, to have or sell, or to import or export, antarctic plants from Specially Protected Areas, antarctic mammals, or antarctic birds. An application for a permit must demonstrate that the import or export would further the purposes for which the species was taken or collected, demonstrate that the import or export is consistent with the purposes of the Antarctic Conservation Act, and state which U.S. port will be used. There are seven designated ports: New York, Miami, Chicago, San Francisco, New Orleans, Seattle, and Honolulu.

Mailing items to or from the United States constitutes import or export.

Applying for a permit

You are the person who initially decides if an Antarctic Conservation Act permit will be needed for your proposed activities. If there is any doubt, contact an Office of Polar Programs science program manager, the permit officer, or the environmental officer (see the roster).

If a permit appears necessary, turn in the *Antarctic Conservation Act Application and Permit Form* (see copy in this book) with the proposal's *Operational Requirements* package.

At least 45 days is required for NSF to review and decide on a permit. During that time, a summary of your application is published in the *Federal Register* so that any member of the public can comment on it. The Foundation evaluates the public comments and performs an internal review. It then approves the application, approves it with modifications, or disapproves it.

NSF will not allow work in Antarctica until a permit either has been approved and issued or is found to be not required.

You may not do things that require a permit unless you have a permit. An application cannot be made retroactive.

FURTHER INFORMATION

Research planning and reports (NSF)

The reports listed below were produced by or for NSF. Publications may be ordered or read on the NSF World Wide Web home page (see instructions on the inside front cover of this book).

Grant Proposal Guide, NSF 95-27, 61p.

Guide to Programs: a Compilation of NSF Funding Opportunities, NSF 95-138, 94p.

Publications of the National Science Foundation, NSF 95-66, 30p.

Facts about the U.S. Antarctic Program, NSF 92-134 (October 1994), 28p.

The United States Antarctic Program (color brochure), NSF 91-92.

Antarctic Journal of the United States (quarterly plus annual review issue), published by NSF. Free to program participants and libraries; contact the Office of Polar Programs. Subscriptions: Government Printing Office, Washington, D.C. 20402.

Antarctic Conservation Act of 1978 (Public Law 95-541), with Regulations, Descriptions and Maps of Special Areas, Permit Application Form, Agreed Measures for the Conservation of Antarctic Fauna and Flora, and Protocol on Environmental Protection, NSF 95-154, 223p.

Waste Management in the United States Antarctic Program, NSF 93-128, 20p.

Antarctic Scientific Diving Manual, NSF 94-148, 128p.

Field Manual for the United States Antarctic Program (NSF 95-120) and brochures describing McMurdo, South Pole, Palmer, *Nathaniel B. Palmer*, and *Polar Duke* are available from the Foundation's antarctic support contractor—

Antarctic Support Associates
61 Inverness Drive East, Suite 300
Englewood, Colorado 80112
303 790 8606

Research recommendations (NAS)

The National Academy of Sciences, with partial NSF support, has published recommended research objectives. For a list or copies, contact the Polar Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 (tel. 202 334 3479). Some recent reports:

Prospects and concerns for remote sensing of snow and ice. 1990.

The role of Antarctica in global change. 28 pages. 1989.

Physical oceanography and tracer chemistry of the southern ocean. 82p. 1988.

Data coordination and career stimulation in polar biomedical research. 39p. 1988.

U.S. research in Antarctica in 2000 a.d. and beyond: a preliminary assessment. 35p. 1986.

Maps, charts, and aerial photographs

Topographic and geologic maps at 1:250,000, 1:500,000, and other scales are available from the Geological Survey, Box 25286, Federal Center, Building 41, Denver, Colorado 80225. An *Index to Topographic Maps Antarctica* is free. Hydrographic charts of the antarctic region are for sale by the Defense Mapping Agency, Office of Distribution Services, Attention DDCP, Washington, D.C. 20315. An index is available.

Aerial photographs and maps produced by the United States and other antarctic nations are available for inspection at the U.S. Geological Survey, 507 National Center, Reston, Virginia 22092 (703 648 6010). World Wide Web site: http://www-nmd.usgs.gov/www/html/scarlibr.html.

One-sheet maps of the continent are available at scales of 1:5 million from the Geological Survey at the Denver address given above or 1:8 million from the National Geographic Society (Washington, D.C., 202 296 7500).

Bibliographies

An ongoing Library of Congress Antarctic Bibliography project covers the world's serious antarctic literature published since 1951. Twenty-three volumes abstracting and indexing more than 58,000 titles have been published as of the end of 1995. Recent volumes are for sale by the Government Printing Office, Washington, D.C. 20402. Some university libraries and Government Depository Libraries have sets.

A monthly awareness list with abstracts (*Current Antarctic Literature*) is published by the Library of Congress including contributions from the Scott Polar Research Institute, Cambridge, England. Libraries and working investigators may subscribe free; contact the Antarctic Information Program (703-306-1031). NSF in early 1996 was getting ready to put *Current Antarctic Literature* on its WWW home page.

The *Antarctic Bibliography*, the *Bibliography on Cold Regions Science and Technology*, and other polar bibliographies are on a CD-ROM disk. Contact NISC Engineering Research Center, Suite 6, Wyman Towers, 3100 Saint Paul Street, Baltimore, Maryland 21218 (301 243 0797). Copies are at U.S. stations and ships in Antarctica, at the International Antarctic Center in New Zealand, and at NSF's Office of Polar Programs. In early 1996 the Library of Congress was working to place its own up-to-date files of these bibliographies on the World Wide Web for searching.

The *Antarctic Bibliography* and companion *Bibliography on Cold Regions Science and Technology* are on line as the COLD data base from Orbit Search Service, 8000 Westpark Drive, McLean, Virginia 22102 (703 442 0900). Many libraries subscribe to Orbit.

A 1951 *Antarctic Bibliography* (NAVAER 10-35-591, U.S. Naval Photographic Interpretation Center) cites the 5,500 references published before 1951. The 147-page book was reprinted verbatim by the Greenwood Press, Westport, Connecticut. Both versions are out of print.

NSF-WIDE PROGRAMS AND PUBLICATIONS

National Science Foundation funds are available for a large number of initiatives intended to assure broad support of science and engineering research and education. For example, a grant for antarctic research can be supplemented by funds to place undergraduate students on a field team. The U.S. Antarctic Program encourages investigators to explore opportunities and to include requests for them in their research proposals.

Some of the opportunities are described in NSF's *Guide to Programs*, updated annually. Another useful book is *Publications of the National Science Foundation*. These and other publications are available from the NSF Publications unit (see inside front cover).

Much of this material—and abstracts of awards, the NSF phone book, etc.—may be searched online or downloaded using NSF's World Wide Web site or STIS (see inside front cover).

About the National Science Foundation

The National Science Foundation provides awards for research in the sciences and engineering. The awardee is responsible for conducting such research and preparing results for publication. NSF does not assume responsibility for such findings or their interpretation. The Foundation welcomes proposals on behalf of all qualified scientists and engineers, and it encourages women, minorities, and persons with disabilities to compete in any of its research and research-related programs. In accordance with Federal statutes and regulations and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, denied the benefits of, or subjected to discrimination under any program or activity receiving financial assistance from the Foundation.

Facilitation Awards for Scientists and Engineers With Disabilities provide funding for assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on an NSF project.

The Foundation has TDD (Telephonic Device for the Deaf), which enables those with hearing impairment to communicate with the Division of Personnel and Management about NSF programs, employment, or general information. Phone 703-306-0090.

This program is described in the Catalog of Federal Domestic Assistance category 47.050.

Privacy Act and public burden

The information requested on proposal forms is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees; to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers, and researchers as necessary to complete assigned work; and to other government agencies in order to coordinate programs. See Systems of Records, NSF-50, "Principal Investigators/Proposal File and Associated Records," and NSF-51, 60 Federal Register 4449 (23 January 1995), "Reviewer/Proposal File and Associated Records," 59 Federal Register 8031 (17 February 1994). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award.

Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Herman G. Fleming, Reports Clearance Officer, Contracts, Policy, and Oversight, National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230.

HOW TO PREPARE A PROPOSAL

Get the Foundation's *Grant Proposal Guide* (NSF 95-27): to order one, see the inside front cover of this book. The *Guide* describes requirements and guidelines for proposals to any NSF program. It covers proposal processing and evaluation; handling of declinations, returns, and withdrawals; some special programs; the award and continued grant support; some considerations for safety, environment, and health; and grant administration. An appendix to the *Guide* contains forms necessary in the proposal.

Use the *Guide* and this book to prepare an antarctic proposal.

Your proposal must convince the Foundation that your project, if approved, can be performed in compliance with antarctic regulations. Worksheets in this book will help you think through and define your plans and will help clarify them to OPP managers. Much of your conservation planning will involve common sense — minimizing pollution, avoiding interference with animals — but the regulations are complex, and you cannot rely on common sense unassisted. Failure to acknowledge the Act in your proposal could change the Foundation's decision from award to declination.

Environmental protection and waste management

Review the Antarctic Conservation Act chapter (above) to be sure you understand your responsibilities for environmental protection and waste management. Fill out the brief Environmental Assessment Questionnaire and, if necessary, an Antarctic Conservation Act permit application, both of which are in this book.

By attending to these matters in your proposal you will enable NSF staff to start to plan support of these aspects in time to avoid delaying or interrupting your field work. Neither the planning nor the implementation need be overwhelming. NSF and investigators have learned that diligence at the proposal stage prevents headaches later.

Safety and health

A proposal that involves work in Antarctica must consider aspects of the research that may pose safety and health risks. Current U.S. Antarctic Program policies regarding safety and health are consistent with U.S. laws and regulations affecting research in the USA. Complete the Safety and Health Checklist in this book to ensure that through the planning process support requirements can be identified and effectively met. You should work through this checklist with your institution's safety and health staffs.

Office of Polar Programs safety and health specialists will review your proposal carefully. They have found that most proposed antarctic research can be carried out without undue risk. However, advance planning is essential, often in collaboration with the proposer. Your full and careful attention to safety and health aspects in the proposal will help to make the planning efficient and effective. During proposal review you may be asked for more information.

Proposals for work in the Antarctic, including the placement of unattended instruments, are not considered for funding if they do not contain the Safety and Health Checklist. Grants are made only if questions regarding a project's safety and health risks can be resolved.

Two Office of Polar Programs staff are assigned full time responsibilities in safety and health. Please feel free to call or write them (see roster) during proposal preparation.

Radioactive materials and waste

If you wish to use radioactive materials (open or sealed sources) in Antarctica, you need to do so under your institu-

tion's radiation use license and with the approval of the U.S. Antarctic Program. Buy the materials through your institution, and register as a radioisotope user with its radiation safety committee. You also must abide by requirements imposed by the U.S. Antarctic Program, in particular radioactive waste generation and packaging criteria for proper disposal of low-level radioactive waste generated during the research.

If your research involves use of radioactive materials in Antarctica (open or sealed sources), complete the "Use of Radioactive Materials" section of the Safety and Health Worksheet. Investigators who have completed that section of the form will receive an additional questionnaire, after the proposal has been funded, requesting details of their proposed radioisotope usage. Proposed use of radioisotopes needs to be consistent with your institutional license and USAP policies. Your institutional Radiation Safety Officer will be required to endorse your use of radioisotopes in Antarctica.

Submit the worksheet in the *Operational Requirements* part of your proposal.

Composition of field teams

Identify in your research proposal all people who will be involved in prospective field projects. Team members should be scientists, technicians, or students with experience or strong interests in the discipline of the project and should have a direct interest in its outcome.

Parties that intend to work in remote areas must have field safety expertise that is appropriate for the anticipated activities, conditions, and hazards. Examples of potentially hazardous situations include mountaineering activities, working in crevassed terrain, and working on sea ice. Investigators should consider augmenting their teams with persons experienced in field safety, particularly if the group is inexperienced in antarctic field work. Training of field party members in first aid is highly recommended.

Physical and psychological screening

Because medical facilities in Antarctica are not equipped to deal with all possible medical emergencies, and because immediate medical evacuation may be impossible, it is important that all persons deploying to Antarctica be in good health. Before deploying, all participants must meet physical and dental health criteria established for the program. Candidates for work at antarctic stations during the austral winter isolation also must pass a psychological screening.

Prospective travelers to the Antarctic with the U.S. Antarctic Program will be provided medical and dental examination forms by the antarctic support contractor. Travelers are responsible for completing their physical and dental examinations and sending the completed forms to the support contractor. Candidates for the winter isolation period will be provided instructions for the psychological screening.

Budget provisions; field services

In Antarctica, most support services are provided and paid for by the NSF-funded U.S. Antarctic Program. NSF does not provide funds in antarctic research grants for acquisition of all needed field items and services. Instead, common-use items are bought and shipped to Antarctica in bulk. This practice, while affecting the way an investigator plans for field work, lowers the cost of acquiring and, especially, of shipping things to Antarctica.

Investigators use their proposals, and the worksheets in this book, to specify services and items of equipment that are required for their research. To plan and budget for acquisition of these things, NSF must know well in advance what they are and approximately how much they cost.

Describe and budget in your proposal as necessary for these items:

(1) equipment and supplies required at home institutions or unique to the field project

(2) radioisotopes and specialized supplies required in Antarctica

(3) physical and dental examinations for all persons going to Antarctica (including those who have been before)

(4) field equipment that is unique to a field project, such as climbing boots and eye protection (the Foundation issues polar clothing including insulated underwear, mukluks, thermal boots, parka, insulated overalls, gloves, and other extreme-cold-weather gear)

(5) shipment of your gear between home institution and port of embarkation (usually a West Coast port; see worksheets)

(6) cost of shipping equipment and samples back home (the antarctic program provides northbound sea shipment to a U.S. port without cost to the grantee, but onward transport to the home institution is paid for using your grant funds)

(7) living expenses (per diem) during travel to and from Antarctica. Budget under foreign travel.

(8) mountaineering guide, if warranted, for remote field work.

Commercial air travel

Do *not* budget in your proposal for commercial air travel between your home institution and the departure point for Antarctica (normally Christchurch, New Zealand, or Punta Arenas, Chile). The Foundation's antarctic support contractor will issue tickets at no cost to your grant. Accompanied excess baggage authorized by NSF in advance also will be covered by the contractor. *Do* budget in the proposal for per diem during this travel [see (7) above] and for any travel not involving deployment to Antarctica.

Insurance

NSF does not provide insurance for grantee personnel in Antarctica, and it does not fund acquisition of this insurance in its research grants. Persons traveling to Antarctica are expected to have insurance appropriate to their normal life situations so that any needed health care, compensation for property loss, worker's compensation, or survivor benefit will be provided for.

Medical care for USAP participants in Antarctica is provided in clinics at the year-round stations. Persons who may need care beyond the capabilities of these clinics will be transported to health care facilities in New Zealand, South America, or the United States, at which point they or their sponsors will be responsible for medical costs.

All research staff (paid or volunteer) should be affiliated in some manner with your institution(s), so any workers_ compensation issues arising from injuries sustained while deployed can be addressed. Most health insurance policies cover travel to Antarctica, but some may not. Policies should be examined.

Deadline "window" for proposals

Antarctic proposals may be submitted each year during the 1-month window between 1 May and 1 June. Proposals received before 1 May normally will be returned for later submittal. Those postmarked after 1 June are subject to return without review.

Number of copies to send

The Office of Polar Programs now requires 20 copies of antarctic proposals. Send all the copies to the National Science Foundation PPU as noted in the "Where to Submit" part of the NSF *Grant Proposal Guide*. (Continue to send 15 copies of proposals to the Arctic Research Program, as indicated in Appendix A of the NSF *Grant Proposal Guide*.)

Proposal approval and implementation schedules

To provide time for proposal review and for operational planning, proposals normally will be considered for field work beginning no sooner than a year later. For example, properly prepared proposals postmarked by 1 June 1996 and approved for award typically will be provided funds for performance periods as follows:

- for research in Antarctica: the 1997-1998 austral summer season and extending through the southern hemisphere winter of 1998.
- for research or data analysis in the United States: starting as early as 6 months following your proposal.

Grant award notifications will be made no earlier than late October 1996.

Complicated projects, or those requiring large amounts of equipment in Antarctica, could require more lead time than indicated above. Projects that are easily fielded may be able to deploy more quickly than the schedule suggests, and NSF strives to make that happen. The rule of thumb, however, is that it takes 15 to 18 months to get ready for antarctic field work, and attempts to beat that schedule introduce uncertainty.

OPERATIONAL SUPPORT

The U.S. Antarctic Program is committed to the principle that scientific needs should determine the research conducted in Antarctica, with logistics deriving from and supporting the research rather than dictating it. Investigators should prepare proposals with the presumption that science can be supported operationally, even if it has not been done before.

To the extent that it is technologically and financially possible, this principle is reflected in the present-day field program. However, at any given time some proposals, highly meritorious scientifically, are not feasible operationally. The antarctic support system and sometimes the proposed field research itself must be modified.

Prior discussion with a science program manager in the Office of Polar Programs (703-306-1033) can help define research objectives that match the operational realities at any given time and will help NSF plan changes in operational support to meet research needs.

Operational capabilities of the U.S. Antarctic Program have evolved greatly in response to scientific requirements and will continue to do so, motivated primarily by dialog between the U.S. Antarctic Program staff and the research community.

For investigators who have not previously worked in Antarctica, contact with the Polar Research Support section of the Office of Polar Programs (703-306-1032) during proposal preparation can be helpful.

Operational Requirements document

Prepare a separate document that discusses operational needs and contains the necessary worksheets (see below).

Use the Operational Requirements Cover Sheet that appears on a following page. Fill out and attach the mandatory worksheets and other relevant worksheets. Include narrative, tables, sketches — anything clear and organized that will help NSF evaluate your operational needs. *Details* of operational matters are not required with the proposal, but NSF needs to know the *scope* of your plan so research-support specialists can evaluate how to support it. (If the proposal appears likely to be approved, NSF's contractor Antarctic Support Associates will solicit details formally by means of a Support Information Package — a SIP.)

Attach one copy of the operational requirements package to the signature copy of the proposal. Do *not* attach copies of this package to the other 19 copies of the proposal.

Put three copies of the operational requirements package in an envelope, mark the lower left corner "Operational Requirements Package," and mail it to:

Senior Program Assistant, Antarctic
Room 755
National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

Worksheets and forms

The worksheets that follow will help you and the Office of Polar Programs evaluate your field needs. They were devised by antarctic research-support specialists who have years of experience in helping investigators plan field work.

If the proposal does *not* include field work in Antarctica, fill out the top half of the Operational Requirements Cover Sheet, check the "No" box, append the sheet to the original signed copy of your proposal, and separately mail three copies as instructed on the sheet. Do not send any other worksheets.

If the proposal includes field work in Antarctica, fill out the first five worksheets below and any other worksheets that are appropriate to your proposal. If a worksheet is not germane to your work, don't fill it out and don't send it in. Put the worksheets in the Operational Requirements package.

PROPOSAL DOs AND DON'Ts

A proposal must convince skeptics (reviewers, panelists, NSF) that the public good will be served by giving you public money. Suggestions:

Do read and follow this book and the *Grant Proposal Guide*.

Do keep text short (project description less than 15 pages).

Do state the problem, the plan, and the anticipated results. Answer the "so what?'' and "why do this?'' questions early.

Do give credit where credit is due; cite your colleagues' work (include titles). *Reviewers can become irate when they find their publications have been overlooked.*

Do give results of research resulting from your previous NSF grants.

Do check and review the proposal with a colleague. *Reviewers may equate error with sloppy research.*

Don't assume that everyone reviewing your proposal is expert in all aspects of your research. *Some reviewers may be chosen for their knowledge of just part of the proposal.*

Don't use a low-quality printer. The type should be clear and easy to read.

Don't leave out vitae of major investigators, budget explanation, other-grant-support list, whole pages, etc.

Don't inflate the budget.

Don't expect an official decision in less than 6 months. Many steps are involved in review.

Your proposal
may *tell* a reviewer what you *will* do,
but it *shows* a reviewer what you *can* do.

LIST OF WORKSHEETS AND FORMS

Use these sheets and others as needed to create an Operational Requirements package.
See page 17 for mailing instructions.

---

[1] Every proposal, even if not involving work in Antarctica, must contain have this page.

[2] Every proposal including work in Antarctica (including placement or servicing by others of unmanned instruments) must contain this page.

[3] Include only if germane to the proposed activity in Antarctica.

[4] Include in proposal if proposed work is regulated by Act. See *Antarctic Conservation Act* book, NSF 95-154.

[5] For work proposed in continental system only (McMurdo and South Pole stations and projects supported from these stations). Continental system does not include Antarctic Peninsula operations or Palmer Station.

OPERATIONAL REQUIREMENTS COVER SHEET

Proposal to U.S. Antarctic Program

These worksheets will help you and NSF know your operational needs. From them, the Polar Research Support section of the Office of Polar Programs will determine if the project is supportable in the Antarctic. If it is, and if NSF intends to approve the project, NSF will set a schedule and a support budget and will allocate resources. Omissions will reduce the chance of adequate support. Do not hesitate to contact the Office of Polar Programs (see roster).

While you needn't give all operational details, it is important that NSF understand the *full scope* of support requested. Investigators experienced in antarctic operations may state their needs in a separate document, but they should review the worksheets to remind themselves of NSF's concerns. This cover sheet is mandatory. If NSF hasn't asked about a key area of your project, use a separate sheet to state your requirements. If NSF decides to approve your proposal, Antarctic Support Associates will ask for details later and will confirm with you your schedule and resources.

Investigator(s) _____

Alternate _____

Proposal title _____

_____

Does this proposal include work in Antarctica? ☐ **Yes** ☐ **No**

If no, turn in only this sheet with your proposal. If yes, please fill out the rest of this page and the relevant worksheets on the pages that follow.

Phone_____ **Fax**_____ **E-mail** _____

Institution _____

Address _____

_____

_____

Date submitted_____

☞ **Mail (don't fax) three copies of completed worksheets, with this sheet as the cover, to Senior Program Assistant, Antarctic, Room 755, NSF, 4201 Wilson Boulevard, Arlington, Virginia 22230.**

PROJECT PERSONNEL LIST AND OPERATIONAL ABSTRACT

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Because of the risks of remote field deployments in Antarctica, investigators need staff with field safety skills (e.g., traverses, mountaineering). Large parties or parties with less-experienced personnel may need more than one safety expert. NSF and the support contractor can provide names of individuals experienced in field safety and survival skills. Provide names or write “TBA” for each proposed team member. If necessary, attach sheet to list additional team members. If no one is to deploy, write “none” in row 1.

	Field team (* = leader)	M/F	From (date)	To (date)	Station or field site
1					
2					
3					
4					
5					
6					

Give a layman’s statement of the work to be done. Discuss operational support and telecommunications needs. Refer to your proposal or use additional pages as needed. Please indicate if this work is to be done with investigators writing separate proposals. If it is, are the requirements combined here, and who is the project spokesperson?

I understand that my activities and those of my team will be governed by the Antarctic Conservation Act and other directives and that my activities in Antarctica will conform with these regulations. Penalties may accrue from violation.

Signature: _____ Date: _____

SAFETY AND HEALTH CHECKLIST

Are you planning to:

1. Conduct underwater diving? ☐ **Yes** ☐ **No**

You will need to meet USAP Scientific Diving Program requirements (see *Antarctic Scientific Diving Manual* (NSF 94-148, 128 p.). You will be asked to provide details of your proposed diving plan at a later date.

2. Use explosives? ☐ **Yes** ☐ **No**

If you plan to conduct your own explosives work, you will need to demonstrate compliance with USAP Explosives Use guidelines. If you plan to utilize the services of the USAP explosives blaster in McMurdo Station, please indicate by checking here _____. You will be asked to provide additional details of your blasting program at a later date.

3. Conduct remote field deployment? ☐ **Yes** ☐ **No**

Field parties operating in the remote field are required to meet USAP Field Safety policies described in the USAP Field Manual. Each field party must have field safety expertise appropriate for the anticipated activities, conditions, hazards (e.g., mountaineering, crevasse travel, working on sea ice). Principal Investigators may need to augment their research team with experienced mountaineers.

4. Use radioisotopes? ☐ **Yes** ☐ **No**

Researchers proposing to use radioactive materials (open or sealed sources) in Antarctica must comply with USAP Radiation Safety policies and those of their home institution. Please indicate planned isotope use below. You will be asked to provide additional information at a later date.

Isotope(s)	**Activity**	**Chemical form**
_____	_____	_____
_____	_____	_____
_____	_____	_____

5. Involve human subjects? ☐ **Yes** ☐ **No**

Researchers proposing to involve humans in their research must comply with Federal regulations regarding the protection of human subjects (45 CFR 46).

ENVIRONMENTAL ASSESSMENT QUESTIONNAIRE

Your antarctic research activities may require environmental documentation. Please complete the questionnaire below. Based upon your response, someone may be contacting you for additional information.

Will your proposed research involve the following?

1. Construction of a field camp (i.e., larger than a tent camp)

☐ Yes ☐ No Location: _____

2. Perturbation experiments such as rerouting waterflow or manipulating habitat of birds or mammals

☐ Yes ☐ No

3. Use of explosives ☐ Yes ☐ No

Location (ie; sea ice, remote field, ice sheet): _____

4. Ice, rock, or sediment coring ☐ Yes ☐ No

5. Release of drilling fluids ☐ Yes ☐ No

Type of fluid _____

6. Excavation requiring the use of heavy equipment ☐ Yes ☐ No

7. The placement of scientific equipment for more than one season or which may be irretrievable (e.g., probes, detectors, cables, etc.) ☐ Yes ☐ No

8. The release of materials into the environment such as bioactive materials, inorganic tracers, balloons, sampling equipment, etc ☐ Yes ☐ No

9. Establishing fuel caches in connection with your research activities (i.e., for fixed-wing aircraft, helicopter, snowmobile refueling, etc.) ☐ Yes ☐ No

10. Bringing non-indigenous species into the antarctic ☐ Yes ☐ No

What species? _____

11. Generating or releasing unusually large volumes of hazardous waste materials (ie; in excess of 20 gallons)? ☐ Yes ☐ No

12. Please briefly describe any other proposed activities which you believe may affect the antarctic environment or any future scientific investigations?

_____

_____

_____

_____

_____

Note: for activities involving native fauna and flora and/or entry into specially designated sites, please familiarize yourself with the Antarctic Conservation Act (ACA) publication and apply for permits as appropriate. It is your responsibility to be informed about all relevant ACA regulations.

SUMMARY OF EACH SEASON'S OPERATIONAL REQUESTS

Investigator(s) _____

_____

Proposal title _____

_____

Please contact someone in the Polar Research Support Section (see the roster in this book) if you need help in making realistic estimates here or on any worksheet.

Season (*e.g.*, '97-'98) or year										
No. people in group										
Radioactive materials?	Y	N	Y	N	Y	N	Y	N	Y	N
ACA permit needed?	Y	N	Y	N	Y	N	Y	N	Y	N
Other permits needed?	Y	N	Y	N	Y	N	Y	N	Y	N
Value of instrumentation requested										
Value of materials requested										
LC-130 hours requested										
Twin Otter days requested										
Helicopter hours requested										
Dates of *Polar Duke*										
Dates of *Laurence M. Gould*										
Dates of *Nathaniel B. Palmer*										
Dates of USCG icebreaker										
Is construction required?	Y	N	Y	N	Y	N	Y	N	Y	N

USE OF RADIOACTIVE MATERIALS

The use of radioactive materials (open and sealed sources) in Antarctica requires strict adherence to the Antarctic Conservation Act and the license conditions specified in your institution's U.S. Nuclear Regulatory Commission or State licensing authority's radioactive materials use license. Responsibility for procurement, shipment, use, and disposal of radioisotopes is borne by the Principal Investigator(s) through their university or institutional license. The institutional Radiation Safety Officer must review and concur that the proposed use of radioactive materials is consistent with their institutional requirements and that the radioactive wastes generated by this research can be returned to the home institution for proper disposal. After an award is made, the NSF will ask each PI to describe procedures and safeguards to be taken in the use of radioisotopes in their research to ensure that those procedures are consistent with the NSF/OPP Radiation Safety Program guidance. The NSF will subsequently notify the PI of the project's approval to use radioisotopes in Antarctica.

USERS **ORGANIZATION**

_____ _____

_____ _____

_____ _____

_____ _____

RADIOISOTOPES TO BE USED IN ANTARCTICA

Isotope	**Chemical form**	**Total activity**	**When?**
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

ESTIMATES OF RADIOACTIVE WASTE

Type	**Number of barrels**
Liquid scintillation or gamma vials	_____ (15 gal/55 gal barrel)
	_____ (1,500 ea 20 ml or 4,000 ea 7 ml vials per 55 gal barrel)
Dry material or solid carcasses	_____ (55 gal/55 gal barrel)
	_____ (cu ft)
Amount released into the environment	_____ chemical form

Organization license number _____

Signature of Radiation Safety Officer _____ Date _____

Name, address, and phone of _____

Radiation Safety Officer _____

(Please type or print legibly) _____

FORM APPROVED
OMB NO. 3145-0034

NATIONAL SCIENCE FOUNDATION ARLINGTON, VIRGINIA 22230	ANTARCTIC CONSERVATION ACT APPLICATION AND PERMIT FORM	PROPOSAL NO.

1. TYPE OF PERMIT REQUESTED

☐ TAKE
☐ IMPORT INTO USA–PORT OF ENTRY
☐ EXPORT FROM USA
☐ ENTER SPECIALLY PROTECTED AREA
☐ ENTER SITE OF SPECIAL SCIENTIFIC INTEREST
☐ INTRODUCE NON-INDIGENOUS SPECIES INTO ANTARCTICA

2. NAME, ADDRESS, PHONE/FAX NO. AND E-MAIL ADDRESS OF APPLICANT (IF A CORPORATION, FIRM, PARTNERSHIP, INSTITUTION, OR AGENCY, EITHER PUBLIC OR PRIVATE, COMPLETE BLOCK 3).

3. NAME AND ADDRESS OF PRESIDENT OR PRINCIPAL OFFICER	4. IF APPLICANT IS AN INDIVIDUAL, INCLUDE BUSINESS OR INSTITUTIONAL AFFILIATION
5. NAME OF APPLICANT'S AGENTS (FIELD PARTY MEMBERS), IF ANY (USE "TBA" IF NAMES UNKNOWN)	6. DESIRED EFFECTIVE DATES

7. LOCATION(S)—INCLUDE MANNER OF TAKING AND PROPOSED ACCESS TO THE LOCATION

8. SPECIMEN INFORMATION

SPECIES	NUMBER	AGE	SEX	SIZE	CONDITION	IMPORT TO USA	ULTIMATE DISPOSITION

CERTIFICATION

I certify that the information submitted in this application for a permit is complete and accurate to the best of my knowledge and belief. Any false statement will subject me to the criminal penalties of 18 U.S.C. 1001.

SIGNATURE	DATE

FOR NSF USE ONLY

This application for a permit under the Antarctic Conservation Act, P.L. 95-541, and NSF regulations contained in title 45 part 670 of the Code of Federal Regulations is approved subject to the following conditions:

THIS PERMIT EXPIRES ON: _____
(Date)

TYPED NAME AND TITLE AND SIGNATURE OF NSF AUTHORIZING OFFICIAL	DATE

NSF Form 1078 (2-94)

CONTINUE ON REVERSE SIDE

9. DESCRIPTION OF ACTIVITY FOR WHICH PERMIT IS NEEDED AND JUSTIFICATION FOR PROJECT. ALSO INCLUDE HERE ADDITIONAL INFORMATION RELATING TO THE SPECIFIC ACTION FOR WHICH THE PERMIT IS BEING SOUGHT.

PRIVACY ACT NOTICE

The information requested in this application is solicited pursuant to the Antarctic Conservation Act of 1978, P.L. 95-541, and NSF regulations contained in title 45 part 670 of the Code of Federal Regulations, and will be used in administration of the overall program. Although provision of any of the requested information is voluntary, failure to provide full and complete information necessary for eligibility determination may reduce the possibility of receiving a permit.

MAIL THIS APPLICATION TO:	OFFICE OF POLAR PROGRAMS (PERMIT OFFICE) NATIONAL SCIENCE FOUNDATION, ROOM 755 ARLINGTON, VIRGINIA 22230

ESTIMATE OF MAJOR AMOUNTS OF HAZARDOUS CHEMICAL WASTE

It is difficult and expensive to handle hazardous wastes in Antarctica. Please think carefully about chemical needs and minimize the amounts in Antarctica.

Hazardous chemical wastes are packaged and labeled in the Antarctic and sent to the United States for proper disposal. They may not be disposed of in the antarctic station sewer systems. So that the Antarctic Program can make packaging material available, please estimate the *major* hazardous chemical wastes expected to be generated by your project.

For assistance, if needed, in completing this worksheet contact the Environmental Officer (see roster).

Chemical	**Quantity (weight or volume)**

EQUIPMENT AND MATERIALS

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Major equipment you need that is likely to be useful again in the U.S. Antarctic Program is usually provided by the antarctic support contractor, not out of your grant. This worksheet helps NSF determine the operational budget to support your proposal and to identify items that require a long procurement lead time. Details will be solicited after an award is made.

Operational equipment (drills, batteries, etc.):

_____

_____

_____

_____

_____

Approximate cost: $ _____

General-use science equipment

If you plan to have general-use equipment supplied by the U.S. Antarctic Program and not by your grant, indicate the equipment (only that whose cost exceeds about $5,000) and its cost. If you know USAP already has the item, you do not need to indicate the cost.

1. _____ $ _____
2. _____ $ _____
3. _____ $ _____
4. _____ $ _____
5. _____ $ _____
6. _____ $ _____

Materials (chemicals, explosives, cryogens, etc.). A detailed list is not required, but NSF needs an estimate of what we should budget.

_____

_____

_____

CONSTRUCTION AND FABRICATION

(Fill out one worksheet for each season.) **Field season: 199___ – 199___**

Use this worksheet to specify needs you anticipate for the antarctic support contractor to build items for your project. Do not use this worksheet for items known to be available in Antarctica or for items to be built under your auspices outside of Antarctica. Do not ask for items to be built that can be bought prebuilt in the United States.

Do you require construction of—

Field living quarters	☐ Yes	☐ No
Laboratories or lab equipment	☐ Yes	☐ No
Shelters	☐ Yes	☐ No
Heavy or special equipment to move a field camp, launch balloons, carry equipment, or support your project in other ways	☐ Yes	☐ No

Describe the above items and their intended use.

Please attach sketches, if appropriate, with dimensions and specifications.

FIELD CAMP REQUIREMENTS

(Fill out one of these worksheets for each field season.) **Field season: 199___ – 199___**

Living space other than Scott or mountain tents:

Field laboratory needs (sketches are useful):

Power requirements (peak and average use):

Bulk fuel estimates

ALBERT P. CRARY SCIENCE AND ENGINEERING CENTER
MCMURDO STATION

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Room type*	Space needed (sq ft)	From (date)	To (date)
BIOLOGY POD			
Office	Y N		
General lab			
Microbiology lab			
Environmental room			
Freezer room			
Microscope room	Y N		
Field party staging room			
ATMOSPHERIC SCIENCES POD			
Office	Y N		
Faraday cage	Y N		
Dark room	Y N		
Assembly and test room			
Receiving and recording room			
Environmental lab			
EARTH SCIENCES POD			
Office	Y N		
Freezer room			
Instrument room/lab			
Rock cut and thin section room	Y N		
Sorting and storage room			
AQUARIUM POD			
Holding tank room			

*Offices and labs contain personal computers connected to McMurdo's local area network. A telecommunications center contains work stations and additional PCs.

SOUTH POLE STATION SCIENCE SUPPORT REQUEST

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Please use this table to request use of facilities at Amundsen-Scott South Pole Station.

Facility	From (date)	To (date)	Sq ft needed	Usage
Skylab				
Cusp lab				
Cosray lab				
Aurora lab				
Science bldg				
CMBR site				
AST/RO facil.				
Clean Air				
Met. tower				
Other (describe)				
Other (describe)				

If you need additional instrumentation, antennas, motors, etc., describe here:

Item	Weight	Rack space req'd	Power (watts, amps)	Power type (ac dc, Hz)	Voltage	Sensor location

Describe other factors important to your project such as vehicles, communications, computers, or meteorological support. Discuss how the location of your sensors or sounders might affect, or be affected by, others.

_____

_____

LC-130 HERCULES REQUIREMENTS

(Fill out one worksheet for each season.) **Field season: 199___ – 199___**

Use this worksheet to request LC-130 (heavy-lift airplane) support between McMurdo and either camps or inland stations in Antarctica.

Site	Latitude (S)	Longitude	Elevation (ft)	Start-stop dates	Gear wt (lb)

If any of these sites have been visited before, please indicate when and provide any pertinent remarks.

Site	Year	Remarks

Please describe any special use required, such as airborne research.

AIRCRAFT

In addition to the large LC-130 Hercules transport airplanes, the U.S. Antarctic Program contracts for operation of helicopters and small airplanes such as DeHavilland Twin Otters.

Please outline your requirements, including total time on site and number of flight-hours.

VEHICLE REQUIREMENTS

snowmobiles, tracked vehicles, trucks

Vehicle type	From (date)	To (date)	Location

HELICOPTER SUPPORT REQUIREMENTS

U.S. Antarctic program helicopter operations will shift from the U.S. Navy to a contracted private firm beginning in the 1996-1997 austral summer. This worksheet is based on characteristics of the Navy-operated helicopters. NSF will adapt the information you provide here to the characteristics of the contract helicopters.

Fill out one worksheet for each season. **Field season: 199___ – 199___**

1. Briefly describe your helicopter support requirements. Please include any specific/unique requirements.

   _____

   _____

   _____

   _____

2. Helicopter support dates (from/to): _____
3. Will you make day trips into the Dry Valleys? ☐ Yes ☐ No

4. Will you establish a remote field camp? ☐ Yes ☐ No
   Number of camp moves: _____. See field camp form.

5. Will you work in a remote field camp and then commute to/from McMurdo to analyze/return samples? ☐ Yes ☐ No

6. Will you require close support (i.e., a helicopter dedicated to your research other than for transit)? ☐ Yes ☐ No

7. Will you be transporting any hazardous cargo (i.e. explosives, fuels, chemicals, or radioactive materials? ☐ Yes ☐ No

8. Please complete the attached worksheet to estimate the number of helo hours required to conduct your field research. The following information should be considered before estimating the number of flight hours and cargo.

---

* A one-way flight to Marble Point is approximately 45 minutes of flight time.
* Maximum helicopter load is 1,600 lb (external/internal).
* Five passengers are maximum, four passengers are preferred.
* One passenger is 200 lb. This includes cold weather gear.
* A 55-gal drum of fuel weighs approximately 450 lb.

* For many locations, you must retrograde all greywater, human waste, and garbage collected by the end of your field season. This must be calculated into your helo request hours.

* Helicopters normally cruise at 100 knots. If your camp is 100 nautical miles from McMurdo it will take 1 hour to get there and 1 hour to return to McMurdo (2 hours total).

HELICOPTER HOURS WORKSHEET

From	To	Wt of pssngrs	Wt of cargo	Hrs flying time	Hrs close support	Total hours
Total requested helo hours						

PALMER STATION LABORATORY FACILITIES

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Lab	Description	Dates of use
1	Genl use: 38 ft bench space, 2 sinks, fume hood, capacity 4 persons	
2	Genl use: 15 ft bench space, 1 sink, cap. 3 persons	
3	Genl use: 15 ft bench, fume hood, 1 sink w sea water, cap. 3 persons	
4	Isotope lab: scintillation counter, HPLC, fume hood, 1 sink	
5*	Genl use: 12 ft bench space, spectrometer, 1 sink, cap. 3 persons	
6*	Genl use: 15 ft bench space, luminescence spectrometer, 2 spectro-photometers, and balances, cap. 3 persons	
7*	Equipment lab: computer	
8*	Equipment lab: epifluorescent microscope	
9*	Common lab: autoclave, 2 freeze dryers, dishwasher, microwave oven, icemaker	
10	Genl use: 25 ft bench space, 1 deep sink, fume hood, cap. 4 persons	

*No radioisotope work to be done in labs 5-9.

Describe the work to be done in each area indicated. Please include your laboratory space requirements, bench space requirements, and major equipment needs.

Other lab facilities required:

PALMER STATION LABORATORY FACILITIES (continued)

Aquarium facilities

Please identify your requirements for holding tank, aquarium, etc.

Description	**Quantity**	**Dates of use**
Environmental room I (linear ft of bench space)	_____	_____
Environmental room II (linear ft of bench space)	_____	_____
Inside the aquarium building:		
Three cascade tanks (4 x 3 x 2 ft)	_____	_____
Four circular tanks (6 ft dia. x 3 ft deep)	_____	_____
One circular tank (8 ft dia. x 4 ft deep)	_____	_____
Outside the aquarium building:		
Four Xactic portable tanks (4 x 4 x 4 ft)	_____	_____
Four circular tanks (8 ft dia. x 4 ft deep)	_____	_____
One circular tank (5 ft dia. x 3 ft deep)	_____	_____

Other laboratory facilities (please describe requirements)

Clean Air/VLF hut _____

_____

_____

_____

Science Library_____

_____

_____

Other (describe)

_____

_____

R/V *NATHANIEL B. PALMER* SUPPORT PLANNING

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

1. Type of work to be conducted from R/V *Nathaniel B. Palmer*:

2. Geographical area where project is to be conducted (provide lat./long. coordinates, proposed tracklines and/or geographic names on chartlet showing proposed work area):

3. Specify amount of time and dates necessary to conduct proposed work. Indicate estimated time to conduct work at each location of proposed study area. Indicate alternative dates.

4. Will you require Zodiacs to support your work? If yes, then indicate work to be supported.

See http://enterprise.asa.org for schedules and deck plans.

R/V *NATHANIEL B. PALMER* SUPPORT PLANNING (continued)

5. Will you be bringing special equipment or instrumentation for use on board? If yes, then indicate equipment and the work to be supported.

Description	Power/space required	Est wt	Est cube

6. Will you be using radioisotopes aboard the vessel? ☐ Yes ☐ No

Will you be using hazardous chemicals aboard the vessel? ☐ Yes ☐ No

If yes, then complete the USE OF RADIOACTIVE MATERIALS and/or ESTIMATE OF MAJOR AMOUNTS OF HAZARDOUS CHEMICAL WASTE worksheets.

7. Total number of people in your group: _____

8. Can the proposed work be performed on *Polar Duke* (*Laurence M. Gould*) if the schedule for the *Nathaniel B. Palmer* is full at the desired time? ☐ Yes ☐ No

9. List any other specialized support requested — for example, helicopters, snowmobiles. (Note: budget restrictions to date have precluded use of helicopters on the *Nathaniel B. Palmer*. This situation may change.)

_____

_____

_____

_____

_____

_____

_____

R/V *POLAR DUKE* (*LAURENCE M. GOULD*) SUPPORT PLANNING

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

1. State type of work to be conducted from the ship:

_____

_____

_____

2. State area where project is to be conducted (lat./long. coordinates, proposed track lines, and/or geographic names on a chartlet):

_____

_____

_____

3. Give amount of time and dates necessary to conduct proposed work. Estimate time to conduct work at each location. Indicate alternative dates.

_____

_____

_____

4. If you need Zodiacs, indicate work to be supported by them:

_____

_____

_____

5. Describe special equipment or instrumentation you plan to bring for onboard use.

Description	Power needs	Space needs	Est. weight	Est. cube

6. Will you be using radioisotopes or hazardous chemicals? ☐ Yes ☐ No
If yes, fill out USE OF RADIOACTIVE MATERIALS. Indicate chemicals on a separate sheet.

7. Indicate shipboard laboratory space requirements.

Laboratory	Bench space (sq ft)	Your request (sq ft)
Upper aft dry lab	110	
Lower aft wet lab	106	
Stbd 'tweendeck lab	124	
Port 'tweendeck elect. workshop	65	
Isotope van	24	

NATHANIEL B. PALMER AND *POLAR DUKE* MAJOR SYSTEMS AND EQUIPMENT

Please check those items that would be required to support your proposed research.

Nathaniel B. Palmer

- ☐ Alpkem rapid flow analyzer (note: no technician provided)
- ☐ Baltic room hydrographic winch (.332 emc x 30,000 ft)
- ☐ Deep sea coring system (requires trawl winch)
- ☐ Deep sea trawl winch, stern a-frame:
  - ☐ 9/16-inch wire rope x 10,000 m
  - ☐ 0.68 electromechanical wire, coaxial, x 10,000 m
- ☐ Digital reflective seismograph (EG&G model 2420)
- ☐ Dive support van, Mako compressor, bottle, and drying racks
- ☐ Freezer storage space (specify cu ft):
  - ☐ 20°F _____ cu ft
  - ☐ –70°F (ultralow) _____ cu ft
- ☐ Lacoste-Romberg gravity meter
- ☐ Magnetic gradiometer
- ☐ Precision depth recorders (3.5- and 12-kHz systems)
- ☐ Radioisotope lab van (8 x 20 ft) with LKB 1409-BCS LSC
- ☐ RDI acoustic doppler current profiler
- ☐ Refrigerated incubator (_____ cu ft)
- ☐ Rosette sampling system (24 ea 5- and 12-liter sample bottles)
- ☐ Sea-Bird CTD system
- ☐ Simrad EK500 scientific echo sounder (38. 120 dual beam, 200 kHz)
- ☐ Swath mapping system (partially functional, not yet fully accepted; check with your program manager)
- ☐ 48-channel seismic profiling system
- ☐ single-channel seismic profiling system

Polar Duke (for *Laurence M. Gould* call OPP)

- ☐ Acquisition system, digital single channel
- ☐ A-Frame, sterm, 11 ton swl
- ☐ Camera, Nikon, Labophot-polarizing
- ☐ Computer, Apple Macintosh IIci, 1 ea
- ☐ Coring system, deep sea (req. trawl winch w ½" wire)
- ☐ CTD system, Sea-Bird
- ☐ Crane, afterdeck, hiab articulating, 5 ton swl @ 9 meters
- ☐ Crane, provision, 1.5 ton swl @ 5 meters
- ☐ Crane, 10 ton swl @ 15 meters, 22 ton swl @ 8 meters
- ☐ Fish finder: Simrad Skipper 810
- ☐ Freezer, ultralow, –70°F, 10 cu ft (_____ cu ft)
- ☐ Freezer, 20°F, 30 cu ft (_____ cu ft)
- ☐ Fume hoods, portable and ventless
- ☐ Incubator, refrigerated (_____ cu ft)
- ☐ Magnetometer
- ☐ Microscope, petrographic
- ☐ Polisher/grinder, lapidary
- ☐ Printer, Buehler, FX80
- ☐ Niskin bottles, 30-liter (12 ea non-rosette mounted)
- ☐ Recorders, precision depth (3.5- and 12-kHz systems)
- ☐ Recorders, single and dual channel, analog, EPC
- ☐ Sail loop acquisition system
- ☐ Samplers, rosette (12 ea 5- and 10-liter Niskin bottles)
- ☐ Sat. nav., Magnavox mx 1107 GPS, dual channel transit
- ☐ Saw, rock, slab and trim, 10 x 040 green blazer blade
- ☐ Seawater, uncontaminated (note use under addl req's)
- ☐ Sonar, sidescan, hull mounted, Furvno
- ☐ Streamer, single channel, variable spaced elements, Teledyne/Litton
- ☐ Tanks, specimen holding (8 ea 2 x 3 x 4 ft)
- ☐ Van, dive support, with Mako compressor, bottle, and drying racks
- ☐ Van, radioisotope lab, 8 x 20 ft, with Beckman 3801 liquid scintillation counter
- ☐ Water gun, air/water combination (bolt combo)
- ☐ Water guns, 100 cu in., 2 ea Hamco HW100
- ☐ Winch, deep sea trawl (½" wire rope x 20,000 ft)
- ☐ Winch, hydrographic (¼" wire rope x 20,000 ft)
- ☐ Winch, hydrographic (0.332 emc x 30,000 ft)
  Note: Hydro winches lead off stbd side J-frame.
- ☐ Workshop, electronics, with spares and equipment
- ☐ XBT system, Sippican MK 9 digital recording model
- ☐ Zodiacs, MK II, III, V; outboards 6, 25, and 40 hp

CARGO REQUIREMENTS

(Fill out one worksheet for each field season.) **Field season: 199___ – 199___**

Cargo to Antarctica				
Date required in Antarctica	Number of pieces	Total weight	Total cube	Special handling category*

Cargo from Antarctica				
Date required at your institution	Number of pieces	Total weight	Total cube	Special handling category*

*Special handling categories:

FROZEN .....Maintain between –10° and +32°F
KEEP CHILLED .....Maintain between +33° and +45°F
DO NOT FREEZE
KEEP DRY
HAZARDOUS
RADIOISOTOPES
DRY ICE REQUIRED
BIOLOGICAL SPECIMENS

HIGH PRECISION GPS SUPPORT

Number of geodetic-quality GPS receivers required: _____

Time period and/or length of time dedicated use of receivers is required: _____

Field engineering support required: _____

Have you contacted UNAVCO about your requirements? ☐ Yes ☐ No

Describe your field operating plan for the GPS work.

PROPOSAL CHECKLIST

☐ Use “Checklist for proposal preparation,” appendix B, *Grant Proposal Guide*

☐ Special antarctic budget items considered

☐ NSF-wide special programs considered (participation of minorities, undergraduates, Young Scholars, etc.: see *Guide to Programs*)

☐ 1 copy of the operational requirements package (see below) attached to the signature (original) copy of the proposal

☐ 19 (*note!*) additional copies of the science proposal made *without* the operational requirements package

☐ mail all 20 copies to Proposal Processsing Unit. See page 2 of the *Grant Proposal Guide* for address. ANNOUNCEMENT NO. is NSF 96-93.

OPERATIONAL REQUIREMENTS PACKAGE CHECKLIST

☐ OPERATIONAL REQUIREMENTS COVER SHEET (even if no field work)

☐ Antarctic Conservation Act permit form if required

☐ Appropriate worksheets filled out

☐ Safety, environment, and health checklists completed

☐ Field party members listed on worksheets, one for each field season

☐ Any other helpful information—sketches, etc.—included

☐ 3 copies of the operational requirements package

☐ mail to address on Operational Requirements Cover Sheet, *not* to Proposal Processing Unit

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MAKE THIS BOOK BETTER!

Good proposals win grants. The Foundation's Office of Polar Programs has observed a positive correlation between planning of antarctic research and success in field work. A key aspect of this planning has been the thought given by investigators to the operational aspects of their research at the same time they are devising research strategies and writing proposals.

This book is our attempt to help investigators focus their research objectives and plan their field projects effectively and efficiently. NSF values constructive criticism from its communities, and we seek your comments on both the text and the worksheets. The book is revised periodically, and your comments will be considered carefully during that process.

Give your comments to your science program manager, to anyone in the Polar Research Support Section, or to the Antarctic Information Program (see the roster on page 44.

Customer service plan for antarctic proposals

The National Science Foundation Customer Service Plan[1*] requires that each program set standards appropriate to its operation. Following is the customer service plan for antarctic research proposals submitted in response to this program announcement.

For proposals postmarked by 1 June, every proposer will be told by 1 November or within 1 month of panel review (if held) that, based on scientific review, the proposal falls in one of three categories—(i) the proposal's science is competitive, (ii) a decision on scientific merit awaits further review, or (iii) the proposal will be recommended for declination.

Proposals found competitive because of their high quality also are reviewed for their operational, safety, and health requirements, and for potential environmental impact. Of these, at least 80 percent will receive the formal NSF award decision by 1 March, and the rest by 1 June. Some proposals may be declined because of lack of operational support in the Antarctic or inability to meet safety, health, or environmental standards.

[1*] http://www.nsf.gov/nsf/homepage/customer.htm, or e-mail pubs@nsf.gov for a paper copy.

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ANTARCTIC RESEARCH

NSF 96-93
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